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ABSTRACT

This report documents research that was carried out on a sample of Ontario secondary school principals in May 1986 to investigate the ways in which educational administrators, as planners, can use the computer. By means of a questionnaire, data were obtained to describe the current situation and the state of the art, and also to identify a future and preferred state of computer usage by Ontario educational practitioners. Questionnaires were sent to 205 secondary school principals (of whom 76 responded), randomly selected to represent each school board in Ontario. The questionaires elicited (1) background information on the principals' current use of computers; (2) information on school scheduling procedures; and (3) information on types of information needed by educational administrators that could then be part of the Management Information System. Findings identified the range of hardware and software currently in use by educational administrators, along with the reasons for using each piece of software. The reasons for not using computer technology were also solicited, and the most common response was lack of resources of all types (human, fiscal, capital and consumable, time, information, and expertise). The final section of the report provides recommendations on a systemwide basis for overcoming the reluctance to change, along with concrete suggestions for the training of educational administrators in the use of computer technology to assist them in their planning tasks. References are included, and the cover letter and questionnaire are appended. (TE)

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THE APPLICATION OF COMPUTER TECHNOLOGY TO EDUCATIONAL ADMINISTRATION -- A PILOT STUDY

by RUTH REES, Ph.D.
Faculty of Education

June 1987

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Faculty of Education
Queens University
Kingston Ontario

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THE APPLICATION OF COMPUTER TECHNOLOGY TO EDUCATIONAL ADMINISTRATION --

A PILOT STUDY

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c RUTH REES, JUNE 1987

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PART I
OVERVIEW OF STUDY

Introduction

The purpose of this report is to document the research activity that was carried out on a sample of Ontario secondary school principals in May 1986 to investigate the ways in which educational administrators, as planners, can use the computer. By means of a questionnaire, data were obtained to describe the current situation, the state-of-the-art, and also to identify a future and preferred state of computer usage by Ontario educational practitioners.

This study was funded by the Faculty of Education, School of Graduate Studies and Research, Queen's University. The funding was based upon the articulation of the various aims of this study, the most noteworthy being an opportunity to explore the ways in which educational administrators, as planners, can increasingly use the computer in their managerial tasks. In order to make a comparison, a base had to be established. That is, how do educational administrators, principals and assistant principals, actually use the computers in their administrative or managerial roles? Also, how do these same individuals anticipate using computers, if they had the requisite expertise? This first aim should help to identify both the present and future level of computer knowledge, skills, and abilities, as stipulated by the educational practitioners themselves. This first level of self-awareness leads directly into the second aim of the study -- a plan to eliminate that gap -- a development program for practitioners.

To clarify further, an additional aim, as a direct consequence of the first, is to incorporate the knowledge gained from the research directly into the content of both the Queen's University Master of Education Educational Administration specialization courses and the Ministry of Education's Principals' and Principals' Refresher Courses. Specifically, two MEd courses -- the Planning Models in Education where strategic planning, planning for some future state, on the macro level, and scheduling and timetabling, on the micro level, and the course Supervisory Processes, investigating the multiplicity roles of the manager, to include such aspects as personnel development, delegation, and evaluation -- are MEd courses where the research results can be incorporated readily. These courses are intended to assist in the preparation of educational administrators both to accept proactively the challenge of change and to adapt to the information era brought on with the advent of computer technology.

The third and final aim of the project is to use this pilot study as a basis for requesting large-scale funding from the Ministry of Education in order to develop training programs suitable for educational administrators so that they can acquire computer expertise, the 'software,' in order to use computer technology, the 'hardware'. The training programs in mind are intended not just to contain content or to be knowledge-based only; more inclusively, the programs are considered as also addressing the affective domain and, to a minor extent, must

include topics concerned with the development of certain psychomotor skills too.

The diffusion of technology into an organization can be stalwarted by many factors both internal and external to the organization (Hodge & Anthony, 1984). Not enough time, insufficient capital and operating funds, unqualified personnel, negative attitudes, reluctance to change, fear of the unknown, tokenism, and a lack of obvious support within the educational system's hierarchy are only some of the institutional impediments to the acquisition and utilization of technology software. Yet, the individual must acquire the necessary knowledge, skills, and attitudes necessary and sufficient to use the new hardware available as a result of technological advancement. It is imperative, then, that mechanisms be established to promote and sustain change, and that these mechanisms occur at a system-wide level (to encompass the educational hierarchy, the institition, and the individual).

For those educational administrators themselves, appropriate, relevant, timely training programs must be put in place. Those programs must entice even those who attest that they are under stress. Ironically, stress in the world of education has been attributed to a lack of time, a situation imposing too many demands on the individual (Klas, 1984) and inadequate coping skills (Hiebert, 1987). Yet, much of the computer software appears to be designed specifically to assist the administrators in using their time more efficiently and to provide certain competencies, such as how to timetable and, more generally, how to make decisions regarding resource allocation. The challenge, then, seems to be the development of a plan of action to encourage the use and application of computer technology by the educational leaders.

While the aims of the study may appear as quite ambitious, the goals of the actual field research were quite specific -- to determine the actual and the perceived future use of computers in administration by practising educators. Once the initial state of the educational administrators with respect to computers is determined, then appropriate professional programs can be developed in order to respond to cognitive, attitudinal, and psychomotor deficiencies.

Methodology

One in three, or 205, of the secondary school principals was randomly selected to represent each school board in Ontario for inclusion in the study. Each principal, by name, was sent a covering letter explaining the purpose of the research accompanied by a three-page questionnaire in May 1986.

The questionnaire was divided into three main sections: one, background information on their own use of computers; two, information on school scheduling procedures; and three, information on types of information needed by educational administrators that could then be part of the Management Information System. Each of these sections is explained and rationalized below.

The first section requested general background information on the

availability, types, and uses (actual and potential) of computers and software in the schools for its administrators. To establish an awareness of the current state-of-the-art, it was considered important to identify what computer hardware and software are in use, and for what purposes. Also since use is a direct outcome of facility with the technology, a question was asked about how the necessary training programs should be delivered.

The second section investigates the (master) timetabling process within a school. Information was also solicited from the educational administrators concerning the positive and negative aspects of semestering. An update of the topic was considered necessary for three reasons. One, no provincial inquiry has been carried out on the merits or problems associated with semestering since the King et al. study of 1977. The topic which recurs in the Ontario education literature merits an update. Two, the 1984 OSIS document recommended semestering in order to implement the Ministry's policy of attaining a more effective public educational system. And three, more and more of the Ontario secondary schools are becoming semestered. Indeed, the latest report is that over two-thirds of the secondary schools are now semestered (Pierce, 1986). Hence, it was considered appropriate to clarify the Ontario educational administrators' perceptions toward semestering, ascertaining whether those perceptions had changed over time and with more widespread use. Furthermore, the decision to semester a school has implications for the master timetabling process; concomitant constraints must be considered by the educational administrators as they plan the school year. The impediments to achieving success at the implementation stage must first be stipulated so that such constraints can either be overcome or incorporated into the planning process.

And the third and final aspect of the questionnaire sought information on the perceived and actual use of a management information system by educational administrators. The intention is to determine what types of information are continuously being requested by those in the principal's office for various decisions. This information should assist in increasing the educational officials' awareness of the application of computer technology to <u>their own</u> jobs. Furthermore, the information should provide concrete examples for the trainers of data base software when professional development activities for the educational administrators are being designed.

Only 76 of the sample of 205 educational administrators responded to the questionnaire, for a rate of return of 37%. Despite the low although adequate rate of return, accounted for by the hectic time of year for school administrators (May-June), the responses were, for the most part, quite thorough. They revealed not only the perspective of a single school, but often the level of the computer activity that was occuring within the particular board.

For example, 49 of the 126 school boards in Ontario (39%) are using Educational Computing Network of Ontario (ECNO) system since its inception in 1981 (Lem, 1981). It is a cooperative venture between the Ontario Ministry of Education and the provincial school boards, geared specifically to administrative functions. The programs include such application software as Student Administration System (SAS), Integrated

Student System (ISS), Student Scheduling System (SSS), Payroll Personnel System (PPAS), Budgetary Accounting System (BAS), and Route Management and Update System (ROMUS). Hence, the data obtained do appear to be quite comprehensive for the province.

Computer software and hardware which were specified by the respondents but unknown to the researcher were investigated and reviewed over the summer and fall months. This report was compiled over the time frame of December 1986 to April 1987.

Findings

The findings from the questionnaire identified the range of hardware and software that are currently in use by educational administrators. In addition, the reasons for using that particular piece of software was elicited. The advantages of using computer technology were contained, in all cases but one, in the more inclusive literature review on the topic.

The reasons for not using computer technology were quite revealing. Lack of resources of all types (human, fiscal, capital and consummable, time, information and expertise) recur the most often. Change, as Fullan (1982) attested, must be system-wide, incremental, and well planned. For the most part, the three-phase suggestions that Fullan made provides an excellent basis from which to develop a plan for the increased use of computer technology by educational administrators.

And, interestingly enough, the study revealed very little new information on the advantages and disadvantages of semestering. The administrators appear to have a good grasp of the benefits of semestering and on the resulting implementation problems. A problem is only a problem if it is not solved. Hence, it is perhaps worthwhile to wonder why or if these concomitant problems have not been resolved over time.

The findings have led to some fairly straightforward discrete recommendations as well as to some complex and interconnected suggestions. All, however, are intended to lead to action in order to promote the increased use and application of educational technology by the schools' educational leaders both now and in the future.

Conclusions

Overall, the research findings reveal how computer technology, the hardware (computer equipment) and software (computer programs), are being used by a sample of secondary school principals and assistant principals in Ontario. Also it highlights some of the problems or impediments (either actual or potential) that exist as deterrents to the use of computer technology by educational administrators. And lastly, the study points out how computer technology is being used currently as well as how it could be used and applied to the educational manager's job.

The discrepancy, then, has been revealed; in terms of computer usage, the investigation has highlighted where the educational

administrators are now and where they could be. But the study, in actuality, has been more than just a needs assessment. The discrepancy does identify the problem. But the research project has sought, through the literature review and questionnaire, to look at a further and a more constructive step, that of problem-solving. Hence, the final section of the resport profers recommendations on an educational system-wide basis in order to overcome the reluctance to change and automate. As well, some concrete suggestions are included for the training of educational administrators in the use of educational technology to assist them in their planning tasks.

PART II
LITERATURE REVIEW

Introduction

A literature review on the topic of the administrative uses of the computers by practising educational managers as planners and their requisite training could be without bounds. Various aspects within that topic could include: one, change theory, with specific reference to technological change; two, the responsibilities of the educational administrator as a planner; three, the state-of-the-art on the educational administrators' uses of the computer; four, types of technological training for educational administrators; and five, ways of encouraging educational administrators to become more proactive to educational technology -- to name only a few.

While all these aspects will be addressed to some degree in this literature review, three topics have been reviewed in detail below. The first is a summary of the literature on educational change: the factors contributing to the change process. The use of computers demonstrates the degree of receptivity that managers have to the most recent change, the advent of computer technology. The second topic entails a review of the current information available on the educational administrators' uses of the computer: the tasks for which administrators can and are relying on the computer; the appropriate preparation recommended to prepare the educational managers to carry out their roles within the information era; and the suggestions offered in the computer applications' literature aimed at increasing the computer technology utilization by educational administrators. Finally, the third topic reviewed is semestering. This represents a specific task of the educational administrator as planner -- that of resource allocator. In order to compose a master timetable, the administrator must decide which way of structuring the school year. As semestering has been recommended in OSIS (1984), an updated discussion of semestering appears to be warrented. An analysis of the topic of semestering should help to identify where the use of computers by the educational administrator can be an asset.

Factors Contributing to Educational Change

Fullan has been a major contributor to the literature on educational change, with Ontario and Canada as his research focus. He wrote that change is a process, a learning experience for those involved, and entails alterations in resources, techniques, skills, beliefs and values, roles, and behaviours (Fullan & Park, 1981). More to the point, in 1982 Fullan produced an extensive review of the literature on educational change.

In that book on educational change, Fullan identified three phases which constitute the change process. Those phases are: one, initiation, mobolization, adoption of change; two, the implementation, initial use of change; and three, the continuation, incorporation, or routinization of change within the organization. He dealt with the topic

holistically, encompassing system-wide change in provincial education which must take involve different levels or groups of individuals, such as ministry officials, board officers, and the tiers of school personnel. The three phases of planned educational change are detailed below.

Phase I -- Adoption of change:

This phase is the fundamental step of the change process. In brief, the adoption phase deals with two aspects of change: one, what is being changed; and how the change will occur.

Change itself must be clarified first so that it is understood, accurately communicated, and then assessed whether it is of high quality or not (that is, to ascertain whether the need for change exists). As change may involve different values, controversial material, and a wide variety of people at the different stages, it must be made very explicit at the beginning.

The second component of the adaption phase deals with the way in which change occurs. Change occurs through people within the school system or larger organization; people can facilitate or block the change process. Hence, Fullan specified that change is more likely to occur when:

-- people are proactive, with a problem-solving orientation;
-- change is mandated through a policy legislated by central administration;
-- central administration not only advocates but also actively supports change by providing access, resources (time, equipment, training, necessary expertise, information, and additional funds), and the concomitant authority;
-- peers are mutually supportive;
-- linking systems (consultants) are in place and supportive;
-- the community does not oppose the change.

Fullan cautions the reader that change may involve alternations to the values, roles, and behaviours of the members of the organization, as well as a structural change. Hence, it is important to understand that the initiation of institutional change is a function of its immediate macro environment, the organization itself, and the individuals who comprise the organization.

It is suprising that no mention of training or professional development is made at this adoption stage of change. Fullan has introduced it in the next stage; yet it should also be included in the preliminary stage. If personnel are not prepared to use or do not know how to use the technology, even at a very fundamental level, surely program implementation will be slowed down while this orientation occurs. Moreover, the carrying out of an introductory low-key orientation program may, on the one hand, provide the necessary lead time for the psychological adjustment to change and, on the other hand, bring out implementation problems at an earlier phase which require that some sort of corrective action be taken (such as, allocating classroom space differently, or adding more electrical outlets). Hence, training programs and resources for the professional development programs should

be incorporated into the initiation stage, as well.

Phase II -- Implementation of change:

Fullan disaggregates this second phase into four distinct components: one, characteristics of the change; two, characteristics of the school district/board; three, characteristics of the school; and four, the external environment.

As in the previous phase, the characteristics of the change itself must be scrutinized. There must be a need for and relevance of the change; a clarity of the reasons for and goals of the change (the product); and a specificity of the degree of complexity of the change, in terms of changes in skills, beliefs, teaching strategies, and use and availability of resources, including materials and supplies.

The school district/board level has a large role to play in the implementation of change. Of primary consideration is its history of innovative attempts. Also, the planning that was carried out in the previous stage of change initiation must be seen to be quite thorough. Fullan attests that it is at this stage that personnel development activities become most relevant and timely, demonstrating the school district's commitment to change by means of continued assistance and support and through actively encouraging the increasing involvement or participation of the implementors in the ongoing decisions. It is important that the plan of action must exist, along with a realistic schedule for carrying out the different parts of the change process.

The factors at the school level affecting the implementation of change are three-fold: the role of the principal, the teachers' interactions, and the teachers' characteristics and orientations. The assumption is that the teachers will be the ultimate implementors of educational change.

Fullan states that the principal should be identified as "the facilitator for change." S/he may not be an expert in the area but must be supportive of the change and sufficiently knowledgeable to understand and appreciate the process of what the teachers are going through. It is recommended that the principal in the role of instructional leader, not necessarily as expert, be involved in the training programs.

The ultimate change agents themselves, the teachers, must have individual characteristics which promote change and, too, must be involved in mutually supportive relationships with their peers. They should design and evaluate the teaching materials, reflect on their teaching, and become involved in the professional development of their peers through observing and evaluating each other. This, of course, implies a high degree of trust throughout the organization.

What becomes very clear, then, is that the commitment to change must be consistent and system-wide at the implementation stage. The people within the system, albeit at different levels of responsibility

for the implementation of change, must all be directed towards a similar goal.

Phase III -- Continuation of change:

Two additional factors in this third and final phase of the change process have been specified by Fullan. One is the rate of personnel turnover, as both planners and implementors, and as superordinates and subordinates. Continuity of staff is very important. The second factor is fiscal; a sufficient levels of funds must continue to be available for both the programs and the personnel. Indeed, at this stage of the change process, funds should be directed to these activities as part of the regular budget, rather than through external or 'special' sources. Furthermore, it is important that professional development be continued.

Fullan's comprehensive outline of factors influencing organizational change within the educational systems includes, obviously, the teachers as one of the types of change agents. In this research, however, the focus is on the educational administrator, the principal and the assistant principal. Consequently, some of Fullan's factors do not apply. What is relevant, though, is the notion that the intended change must be made explicit, understood, and communicated; and carried out in a consistent, systematic manner, throughout the entire educational system. Overall objectives must exist, and as well as a long term plan. Then appropriate short-term plan(s) must be developed, resources allocated, and the plan must be implemented -- carried out in a persistant yet incremental manner, such that it is scheduled, coordinated and shared among an increasingly wide group of participants; continously monitored; and realistically and reflectively assessed.

The State-of-the-Art

This next section will provide an overview of the current state-of-the-art on the use of computers and computer technology by educational administrators, specifically those principals and vice-principals. How educational administrators can use computer technology in their roles, the types of training required to assist them in carrying out their responsibilities, and listing some of ways educational administrators can become more proactive to change in general and computer technology specifically, are the three topics that will be addressed in this section.

Educators are experiencing the negative aspects of stress, or what Seyle (1974) would call **distress.** Why? Klas (1984) attests that the distress of educators is largely attributed to an insufficient amount of time available to accomplish the tasks with which they are charged. Gatley (1986), as well as others, is convinced that computer technology will 'save' more than 50% of the administrator's time; more precisely, the administrator will be able to accomplish more tasks in the same time available. Hence, he argues, by using computer technology, the manager can spend more time in the role of the leader, dealing with people, not only paperwork.

More generally, however, stress has been defined as an individually perceived phenomenon, the result of transaction(s) between the individual and the environment, where the perceived environmental demands exceeds the individual's ability to cope with such demands. Hiebert and Basserman (1986) assert that this imbalance can be rectified either by treating the **source** of the problem, termed as the stressor, or the **outcome** of the transaction, stress. Behavioralists, such as Seyle (1974), and physicians, such as Hanson (1985), deal with stress management through behavioral, cognitive, or physiological means. But others, such as Hiebert and Basserman, and Blase and Greenfield (1985) advocate stressor management whereby the individual or the superordinate within the organization changes the situation on the one hand, or on the other hand, the individual acquires the necessary coping skills.

The example provided should distinguish between stress and stressor management. A student demonstrates examination anxiety. Stress management would involve the student taking deep breathes, counting to ten, and carrying out other relaxation techniques. Stressor management may include a situational change, such as making the examination procedure less threatening or demystifying the process, or having the individual improve his/her study skills in order to turn the examination into a challenge.

The educational managers as proactive leaders appear more suited to the stressor management. And the taking on and facilitating the acquisition of (new) coping skills could include the three types of development: one, cognitive development in the areas of time (self) management and the application of computer software to work; two, affective development such as taking a more proactive and positive approach to change, the acceptance of new technology, and recognizing the necessity and advantages of retraining; and three, perhaps some new psychomotor skills such as keyboarding.

A Uses of Computer Technology by Educational Administrators

When computers first arrived in business offices, their initial selling point was, and often still is, their wordprocessing capabilities -- inputing, revising, collating, and distributing vast quantities of information. Since the, two additional processes are well known: spread sheet (budgeting) and data base or data management (retrieving only specific data from the larger data base in order to make certain decisions).

Listed as uses of computer technology by educational administrators are (Cheever et al., 1986; Evans & Barnett, 1986; Gatley, 1986; Isherwood, 1985; Corbett et al., 1982):

- -- wordprocessing, to input data, create reports, and link reports with a mail-merge package;
- -- statements of school policies, goals, and objectives;
- -- weighing alternatives (asking 'what if' questions);
- -- problem-solving;
- -- storing and retrieving student information;
- -- recording and reporting student and staff attendance;
- -- registration of students;

-- timetabling and scheduling;
-- allocating and monitoring equipment and room use;
-- inventory control (equipment, textbooks, and consumables);
-- descriptions of services;
-- annual school calendar;
-- budgeting;
-- purchase orders;
-- supply requisitions;
-- maintenance requests;
-- program and service assessments;
-- developing and scoring test items and test batteries;
-- calculating statistics on students, classes, grades;
-- student, class, grade, level, school performance;
-- staff performance assessments;
-- recording and monitoring discipline, attendance, and attrition problems and patterns;
-- typesetting newsletters;
-- carrying out school-based needs assessments;
-- library book cataloguing and check-out;
-- cafeteria accounting;
-- creating and maintaining files on a disk;
-- using the computer hardware available in the school;
-- using the specific application programs available within the school.

Interestingly, the literature lacks any mention of the use of computers in terms of the support and the teaching staff in a school. Recording personnel expertise and experience, documenting staff demographics such as age, absences, turnover, and reporting and monitoring professional development activities and staff performance are only a few examples where immediate retrieval of information may prove invaluable to the educational administrator.

Furthermore, the use of computers to assist the educational administrators in their role as public relations' officer and liaison between the school and the community has not yet been discussed in the literature, even though that managerial responsibility has been identified as becoming increasingly important in the effective schools' research. Advertising the school's uniqueness, extolling the school's laurels, and informing the public of both routine and nonroutine school events -- indeed, any activity requiring extensive documentation, revision, and mass distribution -- are tasks which are suited ideally to be handled by means of computerized wordprocessing.

B Types of Preparation Required

Two schools of thought exist with respect to the use of computer technology, both which have implications for training programs. One school of thought views the computer as a tool; the other that the computer is a means of creating or innovating. Shavelson and Salomon (1985) contend that computers should be considered from both perspectives.

If used as a tool, then computer training should be applications-based (Lockheed & Mandinach, 1986). The time-consuming, routine, and ritualistic tasks which consume the administrator's day as well as the more sophisticated tasks like resource allocation could be handled by appropriate software. This training would require a certain level of knowledge, such as learning to use the elements basic to computer software (that is, acquiring a certain level of competency or computer literacy), and learning certain design skills, including how to develop and use templates as well as procedural skills.

Lockheed and Mandinach contend that such application-based computer training should foster higher cognitive skills, by encouraging the generalizing of these skills and fostering a positive attitude towards change and self-improvement. Moreover, Olson (1985) attests that by learning to communicate with the computer, one becomes more literate, merely through the process of making one's meanings explicit. The computer can be used not only as a tool, but also as a tool of the mind.

The second school of thought considers computer technology as an opportunity for educational administrators to "blend school effectiveness, and leadership and management development into a program for revitalization" (Mojokowski, 1985, p. 45). Rather than just automating, the leaders should reconfigure the task or the given problem. They should be asking "what if..." questions, using the computer for simulations. More data and more easily assessible data, ideally, should allow for a greater number of alternatives to be considered in the decision-making process (Hoy & Miskel, 1978).

This second school of thought recognizes the entrepreneurial role (Mintzberg, 1975) of the manager, the educational administrator. It might be difficult, however, to determine what types of professional development activities would be appropriate to encourage administrators to become (more) creative, innovative, risk-taking. In the least, they should become reasonably competent with computer software in order to manipulate the software to suit their own programatic needs. More fundamentally, perhaps, they must acquire a positive attitude towards change in general and a confidence that they and their staff can create a future of their own choosing -- what Ackoff calls the interactive planning mode of management (Ackoff, 1981).

And others attest that through programming the computer, rather than merely applying ready-made software programs, the higher order skills will become developed, thus facilitating the individual to become truly creative (Cheever et al., 1986; Papert, 1980). Regardless of the process, of importance is that educational managers **use** computers to accomplish the range of tasks for which they are responsible -- not only the routine and maintenance tasks, but also solving problems and the unique tasks that come their way. Isherwood (1985) recognized, somewhat realistically however, that some educational administrators will only be "users" of the technology, while others will be "creators".

If the choice is computer training by self-study or by use of a trainer, Bryan (1986) reports that using a trainer is easier and more effective. Of the industries he studied, 84% stipulated that they preferred trainers who were co-workers rather than outside

consultants. And Sununu has stipulated that training should come from a variety of sources, not just one (external) agency.

The majority of the literature appear to concur on two points. One, to **use** the technology both to teach and learn the technology. And two, to emphasize, even initially, the **practical** computer applications. As Guskey observed (1986), only by having educators recognize that their changed practices are of positive benefit, will they change their values and beliefs. Summarily, although attendance to the cognitive, attitudinal, and psychomotor domains are all required for any long-term change, the computer training of educational administrators should be of a practical orientation, at least initially.

C Ways to Increase the Educational Administrators' Use of Computer Technology

This section will detail recommendations on ways to encourage the educational administrators' in their use of computer technology. Both the change literature above and the rather frugal literature available on the educational administrator's use of computer technology will be incorporated here.

Despite all the advantages of using computer technology to aid the educational administrator as listed above, the literature notes that few principals are using the technology (Sturdivant, 1986; Sununu, 1986; & Corbett, et al., 1982).

Corbett et al. provide some specific reasons as to why educational administrators as a whole do not seem to be making extensive use of this technology. Those reasons given are: one, computers (hardware and software) are too expensive; two, a lack of personnel with necessary expertise; and three, insufficient time to get started on such a program. Sununu noted that few school districts developed policies on how they planned to use the technology; yet, this aspect is fundamental to the change process, pointed out by Fullan within the adoption phase of change.

In addition to the factors contributing to the change process which are listed above, the literature on the educational administrators' use of computer technology offers some specific recommendations to promote its increased acceptance and a wider use.

First of all, if educational administrators are considering the computer as a means of using their time more effectively to reduce the stress of the position, then Pogrow (1983) attests that the software must adhere to the "basic principles for automating paperwork." In his own words,

> **the time required to assemble the data for computer entry, plus the time to enter the data and make necessary modifications to the computerized data, must be less than the amount of time required to assemble the data and calculate**

the results manually. (Pogrow, 1983, p. 124)

Pogrow goes on to clarify that the above requirement will be met if the following conditions exist:

> 1. The computer program must perform extensive processing operations on each piece of data entered into the system.
>
> 2. The number of subsequent changes that need to be made because of errors at the time of data entry must be minimal, because each piece of data that must be corrected has the net effect of at least tripling the labour involved in entering information. (This assumes that it takes time to determine that an error has been made, as well as why or where.)
>
> 3. Those responsible for assembling the data should also be able to enter the data directly into the computer, and those responsible for using the data should be able to retrieve specific pieces of information directly and on their own (with close to immediate system response).
>
> 4. When changes need to be made in the data or report formats because of changing circumstances, they must be able to be made directly (perferably) on the computer by those either assembling or responsible for using the data. (p. 124)

If any of these conditions are not met, that piece of computer software is **not** considered as a net time-saving device and, by implication then, would not have utility to educational managers.

In order for the individual, the educational administrator, to use computer technology, several steps must be taken, not only at the school level but at the school board level, as well. For the most part, the suggestions offered in the computer technology literature are included in the more general literature on the planning and implementing of educational change as summarized by Fullan (1982) and detailed above. Mojokowski (1986), Sturdivant (1986), Sununu (1986), Pogrow (1983), and Corbett et al. (1982) all have provided input to the recommendations which are listed below.

1. Establish policies early;
2. Standardize hardware and software;
3. Use technology to teach technology;
4. Emphasize practical computer applications;
5. Use own educational personnel with computer expertise for at least part of the on-site training;
6. Use software that adhere to Pogrow's principles for automating paperwork;
7. Attend workshops on both the administrative and the instructional uses of computers;
8. Keep up, even peripherally, with the changes in the field, by subscribing to even one journal on computer technology;
9. Join a computer network not only for support and to share information, but also to try to force market compatibility;

10. Spend some time with educational administrators who are using computers in varied administrative/managerial applications;
11. Request that salespersonnel come into the school to demonstrate their equipment and software in the appropriate setting or context in which they will be used;
12. Look for federal, provincial, and local financing in the purchasing of computers;
13. Actively promote the advantages of the uses of the computer technology in order to help other staff members develop a positive, receptive attitude to the technology;
14. If possible, have a computer in use in a visible place within the school, such as the front office, to demonstrate its utility;
15. Make or have modifications made to the software in order to better meet the institutional needs;
16. Using other staff members, develop longer range plans, with the ultimate objective of incorporating computer technology throughout the school;
17. Be part of a school board which encourages the experimentation and use of computer technology; and
18. Use computer technology not only for routine tasks but also for problem-solving.

The suggestions listed above reveal the complexity of the planning and implementing of any educational change. New knowledge and skills must be acquired in the specific ways identified above, people must have an open and supportive attitude and a willingness to share in the experience, and the change cannot be restricted to the educational management staff of a school; the change must be pervasive throughout the educational system -- at the levels of the province, board, and school, and at the multiple levels within the school itself.

Semestering

The educational administrator, as a planner, has responsibilities of setting the goals for the organization **and** developing a plan of action on how to get there. The aim of the Ontario educational system is to help students develop to the maximum of their potential as individuals. Accordingly, in 1966, the credit system was implemented in order to facilitate an increased individualization of programs (Brophy, 1978). The means by which students can attain their course credits is part of the plan of the educational administrator. This is a resource allocation decision -- how time can be scheduled: full-year programming, trimestering, or semestering with full or half-credits.

While the secondary schools in Ontario have experienced the gamut of structural arrangements, data indicate that, in comparison to the four schools which were fully semestered in 1970 (King, et al., 1975), the majority of them (67%) were semestered by 1985 (Pierce, 1986).

To review, a semestered school is one where its year is divided into two discrete terms, with final examinations at the end of each term. Each term is approximately 16 weeks in duration, the first from September to January, the second from February through to June. A typical semester is said to consist of either four or five periods, each

of 60 to 80 minutes in length. Ideally, a student would take four or five subjects the first semester, and a different four or five subjects the second semester.

Hoy and Miskel (1978) remind the educational administrator that decisions **should be made** based on some rationale or a weighing of certain alternatives and their probability of successful implementation. Although Mintzberg (1976) would argue that decisions are made more on intuition than after careful analysis and assessment, it still appears worthwhile to investigate the documented advantages and disadvantages of full semestering in order to provide substance to the decision-making process.

A Advantages of Semestering

Probably the most comprehensive list of the advantages and the disadvantages of each of the different types of structural arrangements of the master timetable was developed by King et al. (1975, p. 8). A review of the literature since that date will be offered here in order to revise that list in accordance with the ongoing research.

The first general advantage has been said to be more effective teacher/learning experiences. Although causality has not been determined, the longer instructional periods appear related to a greater amount of teachers' time being spent on lesson planning (Brophy). Also a greater variety of teaching/learning methods are reported as being used (e.g., less lecturing by teachers, more small group discussions, greater student involvement in classroom decisions, more field trips) (Raphael, et al., 1986; Brophy, 1978; Ross, 1977). King et al. (1977) question this last finding as students within the semestered system did not appear to be any more interested, any more highly motivated, or had any better study habits (Ross, 1977). Individually, however, students attest that they have higher motivation with the shorter course length and the fact that in February they have a completely different timetable (James, 1986; McDonald, 1986). Furthermore, if better attendance and less student discipline problems are indicators of increased individual motivation, then both teachers and students are more motivated within semestered schools (King et al., 1977, 1975).

Certain subjects, as reported by the subject teachers, appear to lend themselves more to the longer periods common to the semestered system, such as business, technical, art, physical education, and science subjects; subjects such as mathematics, modern languages, and music do not (King et al., 1977). Raphael and Wahlstrom (1986) have found that students in semestered schools have a more favorable attitude to science than those in non-semestered schools; however, the students' attitude to mathematics remains unchanged (Raphael et al., 1986).

And despite the fact that semestered schools place more emphasis on formative tests and less on final examinations (King et al., 1975), student achievement in mathematics, biology, and chemistry was higher in non-semestered schools (Raphael & Wahlstrom, 1986; Raphael et al., 1986). Indeed, King et al. (1977) noted that the general level students were progressing slower in semestered schools than the advanced level

students, with failures in the general level mathematics course. The advantage, though, of the semestered school is that this mathematics course can be timetabled in both semesters in order to accommodate to the needs of these students.

The second main advantage of the semestered school system is said to be increased flexibility for students to complete their (more individualized) programs. The previous example cited of offering the same course for credit in both semesters provides a means for the slower learner to catch up, yet remain with peers. Two entry points within any one school year, then, could allow the school to respond to such social realities as:

- -- course repetition,
- -- course acceleration,
- -- family mobility within the province,
- -- temporary withdrawal from the school system,
- -- travel or work experience,
- -- unanticipated demand (or lack of demand) for a particular course,
- -- a temporary lack of adequate resources (such as human, equipment, or financial resources), and
- -- dual exit points in each school year which in turn could encourage dual entry points into the Ontario community colleges or into the work force.

The OSIS document anticipates, because of the resultant flexibility of students' programs due to semestering, that students will be graduating from Ontario secondary schools after four and four and one-half years, as well as after five years.

Although two distinct terms requires that the school administration develop two master schedules over the course of the year, the second one could be developed in accordance with the immediate needs of the client groups, and, at the same time, correct for any anomolies that occurred within the first semester.

The third main advantage listed by King et al. (1975) is a more efficient use of all educational resources -- facilities, equipment, instructors, programs, and even schools. Longer class periods and hence less scheduling problems could result in the increased use of the gymnasium and laboratories. Indeed, the single or double lunch break could include extra-curricular activities to accommodate to the bussed students. And although teachers have a heavier workload with respect to curriculum redesign and continuous student evaluation, they do have less classroom preparations.

If more student-centred activities occurred within the semestered schools, an increased demand by the students could be made upon the resource centre and staff, reference books, and audio-visual materials. This curriculum change may result in an increase in expenditure initially, but the greater utilization might make it cost-effective in the long term. To date, cost-benefit studies have not been carried out on semestered schools.

And just as the semestering of schools forces administrators to reconceptualize the use of individual classrooms, OSIS suggests that

educators go one step further and rethink their use of schools. The report recommends that schools become specialized so that equipment and other resources can be centralized, so that the demand on the programs is ensured. A student who would like to specialize in auto mechanics, for example, could easily change schools, either temporarily or permanently, in order to take the appropriate courses. One school cannot meet all its students' individualized demands; the assumption is that the schools within a board can meet, collectively, its community's educational needs.

The last of the documented advantages of the semestered school is the close student-teacher relationships (Brophy, 1978; King et al., 1975). A student and teacher are in close proximity for 60 to 80 minutes each day for five months. Teachers said that they knew their students better, and students concurred (Brophy, 1978). Although the continuous monitoring of student progress could be arduous, this intense interaction may result in more accurate student assessments. Again, the dearth of research in this area allows for only surmise.

Ross' (1977) findings, however, were that no significant difference existed in the interpersonal relationships between students and teachers. Furthermore, one of the concerns mentioned by King et al. (1975) and still discussed today is the issue of 'homeroom'. Do students in semestered schools have a homeroom? The very idea of a homeroom was to provide students with a sense of belonging and to be able to develop a relationship with even one teacher, despite the fact that their timetable is a rotational one. To take away the homeroom concept may cause some students to feel alienated. Yet, in a semestered system, if there is a homeroom, when do these homeroom activities occur, and, furthermore, does the homeroom stay the same throughout the year, although the timetable changes for the second semester?

The feeling of belonging on the part of the students is surely another area which requires some research. The paucity of research, to date, fails to demonstrate whether this aspect and several of the others above are advantages or disadvantages of a semestered system.

B Disadvantages of Semestering

Many of the disadvantages associated with semestering have already been mentioned in the previous discussion. Indeed, to some, even the idea of change is threatening, and is enough to elicit negativism. Hence, each of the above advantages of semestering could, undoubtedly, be countered with a disadvantage.

Rather than encouraging such reactivism, however, only additional and perhaps less obvious disadvantages will be brought out here. As before, King et al. (1975) provide the most comprehensive list.

The main concern of teachers is that less curriculum content is being covered in semestered courses, although they attest that the quality of the content covered is better. Again, this would suggest that curriculum redesign is in order and perhaps teachers, despite their statements to the contrary, require training on how to reconceptualize

the curriculum process.

As mentioned previously, any change results in an increase in workload, at least initially. To some, semestering which promotes biannual master scheduling, course and curriculum redesign, and continuous student testing and evaluating could be considered as an opportunity to experiment; to others, the extra work will be construed as an undesirable and unnecessary burden. Teachers, Klaus (1984) noted, have too much to do or, conversely, not enough time to complete all their tasks. Consequently, they experience stress. To add to their workload, however, without providing them with additional resources may prove detrimental to the group as a whole. Computer software to handle many of the administrative tasks of the teacher and the principal has been developed already. Indeed, as commented earlier, some of these programs have been documented as reducing the user time by half.

Another concern regarding the semestered school relates to student absences. If a student becomes ill or misses school for any variety of reasons, the task of catching up in the semestered school becomes more difficult. Schools, however, cannot plan for students who are **not** in attendance, but rather for those that **are** in attendance. At the most, though, a student could lose one semester, rather than the entire school year.

And the final documented disadvantage of the semestered school is the problem of knowledge retention. Students are involved intensely in one course for one semester and may not return to that course until eight months or perhaps even a year later. The counter argument is that learning should be 'across the curriculum' and not isolated to discrete courses. What was learned in the first semester English course, for example, should be reinforced in all the other classes. Rather than saying that semestering results in discontinuity of the teaching-learning cycle, changes concurrently implemented across the curriculum could contribute to, just as likely, a more continuous and internally supportive teaching/learning cycle.

C Conclusions

It is beyond the scope of this literature review to determine whether semestered or non-semestered schools are better. Decisions are not always based on pure reason. The intent of the review was twofold: one, to compile a current list of the advantages and disadvantages of semestering so that those educational administrators could consider many of these aspects before making a structural change to the school's fundamental organization; and two, to reinforce the notion that scheduling, as many of the educational administrators' tasks, can and should be handled, not manually, but with the assistance of a computer.

Regardless of the decision to semester or not, either decision may result in new issues that must be addressed or resolved. Each choice will lead the administrator to make consecutive decisions; some will undoubtedly involve change and additional work on the part of all personnel. Even those who are reluctant to change must recognize, however, that change is inevitable and is an intrinsic part of <u>every</u> viable organization.

Summary

Educational administrators appear to be moving in the direction of semestering their schools. Such tasks involve considerable work, often of a nature that is different from the preparation of most principals. This and other planning tasks within the principal's mandate are well-suited to being completed by means of computer technology. But, the use of such technology requires change and support on an educational scale much wider than the principal's office; the board and the provincial administration must be supportive in an active manner. The principal, too, must acquire not only new conceptual and also psychomotor skills, but also a change in attitude -- proacting rather than reacting to the change brought about by this information era. The literature offers some suggestions for the implementation of change in general and also more specific but consistent recommendations for the increased use of computer technology by educational administrators.

PART III
METHODOLOGY

This aspect of the report documents the methods used to collect the data of the study. In brief, one of every three principals of secondary schools in Ontario were asked how they were using computer technology, how they would consider using this technology in the future, and what recommendations they could make in terms of software and computer training programs.

Specifically, in May 1986, a letter accompanied by a three-page questionnaire was sent out to one of every three secondary schools in Ontario, requesting certain information from the principals and/or assistant principals of that school. (See Appendix A for copies of both the letter and the questionnaire.)

The schools were selectively sampled within each school board to ensure that schools both large and small, urban and rural, and comprehensive and vocational, were equally represented. In total, 205 packages were sent out. Three weeks were allowed for the return of the questionnaires.

The questionnaire was on a much smaller scale than was intended initially. Printing and mailing costs inhibited the investigation. Regardless, this project was only intended as a pilot of a larger, more comprehensive study to be carried out at some future date. At that time, the principals of elementary schools will be consulted as well. Their tasks are somewhat different than their secondary school peers; hence, it would be expected that their administrative uses for the computer would differ as well.

The questionnaire consisted of three categories, with the questions tailored to fit on each of three pages. The first category was to describe both the hardware and the software used, identifying at the same time the purpose for using that software package. Also two additional questions were asked in order to survey: one, what types of training would the administrators consider appropriate in order become competent in the computer technology; and two, how the administrators could conceive of the assistance of the computer in their roles.

The second category and second page of the questionnaire dealt with one specific planning task for any educational administrator -- that of scheduling. Scheduling encapsulates quite a number of tasks for the principal -- timetabling for the whole school, each instructor, each teacher; and room allocation, to name only a few. Timetabling can also involve different groups from both inside and outside the school, such as Ministry officials (from the Educational Computer Network of Ontario -- ECNO); furthermore, timetabling can be made more complex by the type of school, such as a semestered one. A previous study on school-based packages by King, Rees, and Hughes (1986) indicated that a greater number of schools are becoming semestered, as a direct result of the OS:IS document. Consequently, questions on the type of school, the advantages and disadvantages of semestering, and the process of developing school schedules were solicited within this section.

Information gleaned informally appeared to indicate that computers were being used after the fact, to store the scheduling and timetabling information, rather than as a problem-solver, that is, to help develop the timetables. The research was an attempt to determine if that indeed was the case across Ontario, or whether some schools had located suitable scheduling software which met their needs.

The final page of the questionnaire consisted of questions relating to Management Information Systems -- the documentation and retrieval of data. Management consists of making decisions based upon information; information is usable data, data which are often merely collated and displayed in a very specific format. Knowing that educational administrators are constantly seeking and sorting data to be used as information, questions were asked as to the types of data base software programs and the types of categories commonly used by administrators. Responses to this latter question could help to determine the complexity of the data base software that would appear to be required by educational administrators.

It should be evident to the reader that only a minimal number of the educational administrative tasks associated with planning have been addressed in the study. To reiterate, this research is to be considered a pilot study of a much more inclusive one. While the principal investigator was able to focus the study of these three components, others, clearly, should have been addressed. The researcher used her judgment and particular expertise in focussing in on the two main aspects of scheduling and management information systems.

PART IV
RESEARCH FINDINGS

Introduction

In this part, the data obtained from secondary school principals or associate principals as collated from the questionnaires are described in detail. The data represent 37% of the sample selectively chosen from all the secondary school educational administrators in Ontario.

To reiterate, 205 letters were sent to principals of every one of three secondary schools in Ontario in early May 1986. A copy of that letter is available in Appendix I. The schools were selectively sampled within each school board to ensure that secondary schools both large and small, urban and rural, and vocational and comprehensive were equally represented. The principals or their delegates were asked to respond to a three-page questionnaire on the availability of computers and their own school administrative use of computer software. Appendix II contains a copy of the questionnaire.

The administrators were asked to mail back the completed questionnaires in early June. It was hoped that such a deadline would ensure a greater response rate by avoiding administrative activities associated with year end. Although the bulk of the completed forms did arrive in June, other questionnaires were returned as late as August 1986. In total, 76 of the 205 questionnaires were completed; several wrote accompanying letters to clarify a particular point. The rate of return, then, was 37% -- certainly sufficient from which to generalize on the Ontario secondary schools as a whole.

The Findings

Each section of the questionnaire is summarized below. Responses are listed in both numeric and percentage formats, where appropriate.

Section I -- Computer Use

1. Question C 1.0.

A majority of the respondents (69.5 out of 76, or 91.4%) indicated that they had access to a computer for administrative tasks. (Note that the .5 reflects one individual's two responses, both yes and no. No explanation was provided.)

A variety of computers are being used by these educational administrators as shown in Table 1, portrayed on the next page. That table is further disaggregated into three other tables, Tables 2 to 4. One-third or 33% of the computers used by educational administrators are the Personal Computer (PC), and over half of those (52.5%) are the IBM PC. Of next highest usage (22.9%) is the Mainframe available at the school board level. The VAX Digital Mainframe is by far the most popular of the mainframe (56.1%). And the third most popular computer used by the school administrators is the Commodore (20.1%). That

computer has been in the schools for a considerable period of time, in contrast to the ICON which, initially, had little classroom software available, let alone software for administrative/business purposes.

Table 1
Types of Computers used by School Administrators

Name	No.	%
PC's *	59	33.0 %
Mini or Mainframe **	41	22.9
Commodore	36	20.1
Digital	16	8.9
Other ***	8	4.5
Apple	7	3.9
Macintosh	6	3.4
AT	3	1.7
ICON	3	1.7
Total	179	100.0 %

* Table 2
Types of PC Computers used by School Administrators

Name	No.	%
IBM	31	52.5 %
IBM compatible	17	28.8
Commodore PC 10	3	5.1
Corona PC	3	5.1
Compaq 4	2	3.4
Olivetti	2	3.4
Tandy 2000	1	1.7
Total	59	100.0 %

** Table 3
Types of Mini/Mainframe Computers used by School Administrators

Name	No.	%
Mini -- VAX Digital	23	56.1 %
Unspecified	9	22.0
Mainframe -- IBM	5	12.2
Mainframe -- Burroughs	2	4.9
Mainframe -- Columbia	1	2.4
Mainframe -- Honeywell	1	2.4
Total	41	100.0 %

***

Table 4
Types of "Other" Computers used by School Administrators

Name	No.	%
Olympia Word Processor	3	37.5 %
Wang Dedicated Word Processor	2	25.0
Micom	1	12.5
Saturn Word Processor	1	12.5
Secretarial-type Word Processor	1	12.5
Total	8	100.0 %

The first question also asked the participants to identify the software which they used and for which of the following purposes: planning, budgeting, filing and retrieving information, student reports, word processing, or other. Table 5, below, highlights the results.

Table 5
Types of Software specified by Purpose(s)

Computer	Software	Purpose(s) 1	2	3	4	5	6
APPLE	Appleworks	2	1	1	1	2	a
	Dbase II	-	2	1	-	-	b
AT	Sims & Pick	1	-	2	3	2	b
COMMODORE	Choices	1	-	-	-	-	
	Calc Result	-	1	1	-	-	
	Jim Osborne	1	1	-	-	-	b
	Manager	-	-	1	-	-	
	Paper Clip	-	-	1	-	5	c
	Scholastic	-	-	-	-	-	b
	Spreadsheet	-	1	-	-	-	
	Superscript	-	-	-	1	2	
	SwiftCalc	1	1	-	-	-	
	Visicalc	1	1	1	-	-	
DIGITAL	Lotus 1,2,3	1	-	1	-	1	
	SAS	3	1	4	4	3	b
	Samna, Samna 3	-	-	1	-	4	
	Symphony	1	1	1	1	-	
	TK 50 Tapes	1	-	1	1	-	
ICON		-	-	1	1	1	
MACINTOSH	Draw	-	-	-	-	1	
	Excel	1	1	1	1	-	
	File	1	-	1	-	-	
	Word	-	-	-	-	1	
	Write	-	-	-	-	1	

Table 5 (cont'd)
Types of Software specified by Purpose(s)

Computer	Software	Purpose(s) 1	2	3	4	5	6
PC's	BPI Accounting	-	2	-	-	-	
	CEMAS	-	-	1	1	-	b
	Columbia	1	-	1	2	-	b
	DBase III	1		3	1	-	
	Knowledge Mangr	1	-	1	1	-	b
	Lotus 123	2	2	-	-	-	
	Maplewood	-	-	-	-	-	b
	Multimate	1	1	1	1	4	
	Nice Print	-	-	-	-	1	
	Peel Board Pgm	-	-	1	1	1	
	Print Master	-	-	-	-	-	d
	Reportpack	-	-	1	-	-	
	Self-authored	1	-	1	1	-	
	SIM PIC	-	-	1	1	-	
	SSI Data	-	-	1	1	-	
	Symphony	1	1	1	1	-	
	TREVLAC	2	-	2	2	-	b
	Word Perfect	-	1	1	-	5	
	Wordstar	-	-	1	-	3	
	Wycor	1	1	2	1	-	b
Others	Calc Star	-	1	1	1	-	
	Wordstar	-	-	-	-	1	
	Unspecified	1	1	1	1	5	b
Totals (# = 158)		27	21	38	29	43	
(% = 100)		17	13	24	18	27	

Note: Error in total percentage is due to rounding.

Purposes: 1--Planning 2--Budgeting 3--Filing/Retrieving
4--Student Reports 5--Word Processing 6--Other

a Signs and posters
b Attendance, timetabling, scheduling
c Inventory
d Graphics

The greatest variety of software is used with the PC's, the IBM of an IBM compatible system, and secondly on the Commodore computers. And the most common purpose that the software is being used by educational administrators for word processing, then for filing and retrieving information, followed by student reports, then planning, and lastly, for budgeting. There appears to be a positive correlation between usefulness of the software, the variety of software, and the popularity of the type of computer used by educational administrators. The PC's are the most popular computers, followed by the Commodore; similarly, the greatest variety of software and its utility are for the PC's, followed by the Commodore. In contrast, little software other than word processing was available at the time of the research for the ICON; it

is recorded here as being the least popular of the computers used by the educational administrators.

Both timetabling and scheduling have been listed as tasks separate from that of planning, contrary to an assumption of this research. This distinction suggests that perhaps the term 'planning' should have been clarified or further delineated in the questionnaire. Indeed, since few of Ontario's graduate schools offer courses to practising or potential educational administrators in planning, in retrospect, this term demanded greater explanation.

2. The second question (C2.0) probed only that group that did not have access to a computer, the 6.5 of the 76 or 8.6% of the respondents. Four of the respondents indicated that if appropriate software were available, they would use the computer; two indicated that they would not, and one person answered equivocally.

3. And the third question (C3.0) was directed to that same group as in item 2 above. Six people replied to the question, "If suitable learning materials were available, would you be more inclined to use the computer?" Five or 83% checked "Yes," but two gave different provisos: one, providing there was board assistance; and the second, providing the cost of training, hardware, and software were allocated. Only one person checked "No," but supplied the following reason: "not teaching; don't deal with data but personnel." It appears, from this last response, that the individual may have associated data as being quantitative only, and not qualitative as well.

4. Item C 3.1, the next question asked what form(s) would the respondent like the learning materials for specific pieces of software to take. The responses of 61 out of 76, or 80% of the group, are portrayed in the table below.

Table 6
Types of Learning Material for Software

Learning Material	Responses #	Responses %	Rank Order
Written tutorial	27	23	2
Applicable reference materials	25	21	3
Case studies	17	14	5
Common questions/problems and solutions	20	17	4
None of the above unless accompanied by in-service training	30	25	1
Total	119	100%	

One-quarter of the group indicated that any type of learning material with respect to computer software should be accompanied by in-service training. Written tutorials were considered the next desirable form of training material. Interestingly enough, the case study method, a very popular form of training educational administrators, was considered by the group as the least desirable form of training.

Three comments were made: one, the tutorials should be written by a teacher and not be a computer specialist; two, the request was for software which trains the user on the computer; and three, a request was for simulation games. These latter two comments reinforce the recommendation in the literature that the computer should itself be used in the learning process.

In addition, the participants were to list the five items in their order of preference. Only 10 of the 61 who completed this question, or 16%, responded to this additional request. Their priority list differed somewhat from the ranking which was highlighted in Table 6. The results are compared and displayed in Table 7 below.

Table 7
Rank Order of Types of Training Materials

Material Type	Results from Group (n = 61)	Results from Subgroup (n = 10 of 61)
Written tutorial	1	2
Reference materials	3	3
Case studies	5	5
Common questions & answers	2	4
None unless accompanied by in-service training	4	1

Table 7 above indicates that the ranking of the responses from the 61, the total number of the group, differs somewhat from the ranking obtained from that subgroup (10 of the 61, or 16%) who responded specifically to the directions, ("please number in order of preference"). Quite clearly, though, case studies as a form of training are not considered desirable in this context; and the group is ambivalent regarding the utility of reference materials. Despite the frustration associated with written tutorials as a format for learning to use software, this type of learning approach is preferred by the group. Suprisingly, the responses with respect to learning through a set of common questions/problems and their answers/solutions as well as on the issue of in-service training differ between the group's aggregate response and the subgroup's response.

5. The final question in this first section (C4.0) was designed to ascertain how the computer was perceived as being capable of helping the educational leaders in their administrative role. Fifty-four or 71% of the groups responded to this question. Their comments are summarized below, and quoted in their entirety for further reference in Appendix III:

-- eliminate repetitive tasks;
-- speed up clerical tasks;
-- retrieval of information;
-- personal and professional planning, scheduling, and timetabling;
-- inventory of teachers and their qualifications;
-- documentation and retrieval of student disciplinary action;

-- improve accuracy of data by eliminating multiple data entries;
-- simplify updating of data;
-- inquiry into other data bases (e.g., B.Ed.);
-- complete surveys, requests for records, attendance more efficiently;
-- budget designing and controlling; and
-- help with decision making and predicting.

Note that these Ontario educational administrators have revealed something which the literature did not. They recognize that the computer could be used to record personnel, in additional to student, data, such as teachers' qualifications and demographic material. This particular use of computer technology was pointed out previously as being an oversight of previous research.

All these ways that the educational leaders want the computer to help them in their administrative tasks are well within the established capabilities of the available software. The 'hard' technology is available in the form of equipment, computer hardware, and programs, computer software. The task that remains, then, is to encourage the development of the 'soft' technology, the ability and agility to use, apply, and adapt this hard technology, so that computers and computer technology are truly accessible to its intended users.

Section II -- Scheduling

1. The first question (S1.0) was: Who assists in the development of the school's Master Timetable?

The responses to this item, both qualitative and quantitative, indicated that this question was confusing. Not only was it, judging from the responses, poorly worded, but the spacing between the response boxes was confusing. In retrospect, the question probably should have been stated as, What parties are involved in the Master Timetable development? In some cases, only school staff (no students) help to develop the timetable. In other cases, the school uses the support of one or more of the following agencies: the Ministry, the school board, and private firms. Responses from the educational administrators indicated that they considered themselves separate from their school staff. The question was not intended to disaggregate the principal from his/her staff. The written comments revealed the dilemma caused by the wording of the question, but also provided answers. The members of the school staff who assist in timetable development are the principal, the assistant principal, the department heads, the guidance counsellors, the librarian, the computer coordinator, teachers, and secretaries.

The data from this item have been collated in Table 8 to indicate the various groups involved in the development of the school's Master Timetable. The comments plus the marked responses to this question are incorporated so that the intention or the validity of this item is being upheld. The data are rank ordered to highlight the differences. Table 8, below, lists those results.

Table 8
Developers of School's Master Timetable

Developer	Frequency #	%
School staff	22	29
Board and school staff	11	14
Ministry of Education	10	13
Ministry and school staff	9	12
Ministry and Board	8	11
Board	7	9
Private firm and school staff	4	5
Private firm	3	4
Ministry, board, school staff	1	1
Board, private firm, school staff	1	1
Total	76	100

Note: The different groups are rank-ordered by the researcher, and not shown in the order in which they appeared on the questionnaire.
Errors in total percentages are due to rounding.

What this data appear to indicate, then, is that the almost 30% of the schools which participated in the research use solely their own internal resources to develop the school's master timetable.

Surprisingly, only one school pointed out the Ministry's, board's, and the school's joint involvement in timetable development. This result is inconsistent with the Lem (1986) report that 39% of Ontario school boards use the Educational Computing Network (ECNO), the Ministry's computing system, Perhaps the 8 responses, or 11%, which indicated the joint Ministry and board involvement in Table 8 reflect ECNO usage.

The school timetabling and scheduling software mentioned in response to this item were the SAS (ECNO's Student Administration System), TREVLAC, Cogito, and Columbia School System. But other scheduling software were brought out through the responses to an earlier question on page one of the questionnaire. Those additional software mentioned were: Wycor, Maplewood, Knowledge Manager, and CEMAS for use on the PC's, Scholastic and Jim Osborne for the Commodore computer, Dbase for the Apple computer, and the Sims and Pick software for the AT computer.

2. The second question in this section (S1.1) asked if the above method (for the development of the school's Master Timetable) was considered satisfactory, and if not, to provide an explanation. To the first part of the question, 58 of the 76 participants responded favorably, 12 in the negative, 3 both yes and no, 2 did not make an assessment but only commented, and 1 did not respond at all. An aggregation of the data demonstrates that 61 or 80% of the participants consider this method satisfactory, while the remainder of 15 or 20% do not.

All parties, those responding positively, negatively, and equivocally, offered some comments. They are supplied below.

a) Verbatim comments from those considering the current method satisfactory are:

-- "quite pleased with the whole SAS program;"
-- "loading into the computer is superior to manual method, but need the computer to build the timetable;"
-- "now using manual method. Board is phasing in SAS;"
-- "quick turnaround with board and Ministry;"
-- "staff training for SAS is a problem;"
-- "like the micro-mainframe data flow with the Ministry and the simulations;"
-- "reasonably pleased with the private firm;" and
-- "only reservation with private firm and board is that the school can't download."

b) Direct quotations from those who view the current timetable development method not to be satisfactory are:

-- "Master Builder Assist program is unsuitable;"
-- "frustration with turnaround time using the Ministry;"
-- "resolving timetable conflicts is time-consuming; need a 'conflictor' program;"
-- "hoping to get in-school SAS system through ECHO;"
-- "private firms' program inadequate and documentation poor;"
-- "neither Ministry's nor private firms' programs are adequate; creating own software;"
-- "incompatability between systems; not all school requirements met;"
-- "board program is only a 'loader;' need a program that builds the timetable;"
-- "SAS service is slow and telephone lines are a problem, but affordable;"
-- "principal receives too little assistance; program and equipment slow;" and
-- "expanded 'Master Schedule Builder' is being refined, but re-entering data is a problem."

c) And finally, the comments from those who are ambivalent as to whether the current method is satisfactory or not, are listed below:

-- "yes and no, because of time delay in forwarding and returning information;"
-- "prefer standalone operation;" and
-- "would like a modem to access board computer."

3. The third question (S2.0) asked the educational administrators to describe the arrangement of courses within the school. The four categories of full year, trimestered, semestered, and mixed are listed in rank order in Table 9 below.

Table 9
Arrangement of Courses within Schools

Arrangement	Schools	
	#	%
Semestered	38	50
Full year	27	36
Mixed	10	13
Trimestered	1	1
Total	76	100

Of the ten 'mixed' schools, the breakdown is the following:
a) four offer full year courses, but are semestered in the grades 9 and 10 Technology courses;
b) three are non-semestered in grades 9 and 10, semestered in the senior grades;
c) one is semestered, except for the students in the basic program; and
d) the remaining two mix full year and a few semestered courses.

Clearly, the results indicate that the majority of the sampled schools within the province are either entirely (50%) or partially (13%) semestered. Pierce (1986) observed that in 1985 two-thirds or 67% of the Ontario secondary schools were semestered. These research findings here do appear, then, to be consistent with those of others.

4. The fourth question (S2.1) was intended to elicit the perceptions of the Ontario secondary school educational administrators concerning the merits of semestering. Moreover, it was considered worthwhile to discern whether the group that was already semestered offered distinct views from those in schools where semestering was not yet in place. Hence the administrators' perceptions of the assets and the deficiences associated with semestering is divided below into two groups: those who represent the semestered schools and those who manage schools which still offer full year, trimester, or mixed courses.

a) The Pro's of Semestered Schools.

The merits of semestering as perceived by contemporary Ontario secondary school administrators are specified below. In order to compare that data with those merits which have been documented previously in the literature (and available in Part II of this report), the data were disaggregated into the same four categories of King et al. (1975). Those groups are: one, more effective teaching/learning experiences; two, increased flexibility for the students; three, more efficient use of educational resources; and four, close student-teacher relationships. Since educational administrators representing both semestered and non-semestered schools offered similar reasons as to the benefits of semestering, the data from them all are included below, without distinguishing their source.

(i) The specific reasons which have been grouped within the overall semestering attribute of more effective teaching/learning experiences are:
-- teachers are encouraged to diversify their teaching methods and offer a variety of approaches;
-- research activities are facilitated;
-- time is available to do role-playing;
-- learning is becoming more student-centred;
-- semestering promotes the intensive study of fewer subjects;
-- there are less courses/classes per day;
-- teachers have fewer, but more comprehensive course preparations and less students each semester;
-- the less effective teachers or teachers who are not prepared to work are weeded out;
-- there is less stress on both teachers and students;
-- students feel that they are working harder and getting better results; and
-- the longer class periods prepares students for the longer periods at university.

(ii) The second benefit of semestering has been documented as the increased flexibility of students. Comments from the respondents which have been collated within this category are:
-- students can progress at their own pace, with less administrative roadblocks. For example, students can withdraw from a course or from school and restart in the next semester, rather than the next school year.
-- students can 'fast track', recover from failures, change subject difficulty levels, and move into another class, course, program, or school **twice** rather than once within the school year.
-- students have fewer subjects on which to concentrate.
-- students can graduate early in the year, in late January, as well as in June.

(iii) The third major benefit of semestering is a more efficient use of educational resources. Resources here encompass human (both teachers and students), physical resources (buildings and equipment, both consummable and capital equipment), money, time, and information. Some specific reasons grouped within this category are:
-- less time is spent on teacher preparation and more on teacher-pupil interaction;
-- more use is made of the resource centre;
-- longer periods are advantageous for some subjects, particularly for carrying our experiments in the laboratories, in skill classes (e.g., shop), and in Co-op Education classes;
-- there is more time to develop a point in class;
-- students are able to complete or make alterations to their programs in a more efficient manner;
-- semestering facilitates course sequencing which was recommended in the OSIS document of the Ministry of Education;
-- fewer classes during the day result in less movement of students, teachers, and resources throughout the school. Consequently, there is less 'down' time, spent on moving to class; more time remains in class.
-- two master timetables in one school year can result in a greater choice of courses for students;

-- compulsory or over-enrolled courses can be scheduled more often, as warranted;
-- fewer classes per semester in any one subject result in fewer textbooks being required by the school. Although the textbooks get heavier use and may wear out faster, updates can be incorporated sooner.

(iv) And the fourth aspect associated with semestering has been identified as a close student-teacher relationship. Within this category, the educational administrators made the following points:
-- the teacher-student contacts are fewer but more intense, allowing for a teacher to understand and respond to students in a more individualized manner;
-- daily contact is made with the students;
-- it is easier for the Grade 9 students to integrate into the school;
-- the shortened course time-line acts as a motivator and prevents the "February blues;"
-- each semester, both students and teachers make new relationships. This fresh start could be desirable for both students and teachers.

Little new information regarding the merits of semestering was brought out by this research. Other than providing a means for carrying out the Ministry's policy as stated in OSIS, the only additional advantage of semestering uncovered through this data collection is the suggestion that the Grade 9 students find it easier to integrate into secondary school. All the other benefits of semestering have been documented in Part II, summarizing previous research which carried out, and particularly in Ontario. Moreover, the research here reveals that the users and on-lookers alike (Ontario secondary school educational administrators of both the semestered and non-semestered schools) have a similar understanding of the positive attributes of semestered schools, consistent with each other and with the available literature.

b) The Con's of Semestered Schools.

Similar to the preceeding section, the negative aspects associated with the semestered schools will be identified here. Again, since the data did not reveal any differences between those who are administering semestered or non-semestered schools, those points will be revealed below, as applicable to all parties.

(i) The main concern brought out by the educational administrators was that less curriculum is being covered in semestered schools. Two 35-minute classes are not considered comparable with what is covered in the one 70-minute class period of the semestered school. Mathematics was the subject which was identified here.

While it was understood that the longer periods demand a redesign of courses and lessons, the administrators noted that not all teachers were carrying out the necessary changes. Consequently, what was intended as a way of 'saving' time, is being perceived not to be the case. In addition, the semestered schools allocate two, not one, opening and closing days per school year, in order to deal with the administrative tasks; again, this is viewed at being at the expense of the curricula. In contrast, though, the administrators recognize that students need variety and movement; the longer periods in some cases

provide the students with neither.

Longer class periods are perceived as not being the universal educational panacea. Indeed, the administrators commented that these time frames were too long in all instances. Several examples are: for certain subjects, in particular the skill areas, such as Music and Typing; for certain students, immature st dents as well as those in the Basic Modified, Basic, and General level programs; for certain grades, such as grades 9 and 10; and for smaller schools especially, where scheduling is problematic.

(ii) The second criticism made of semestering is with respect to absenteeism. The fact that a school year's worth of material is being offered in one semester demands that students are in attendance. An absence of one day in a semestered program has been equated to two days in a non-semestered school. Lengthy absences, for whatever reason, could seriously jeopardize the student from having a successful semester; the student is forced into a position of both making up and keeping up with course material, itself which is being taught within in a shortened time-frame.

The lack of time between classes is another area of concern for the administrators. The learning is too concentrated, with no opportunity for reading, thinking, or applying the ideas taught between class meeting times.

Indeed, a lack of any of the educational resources is considered critical when time is short. The illness of a teacher, the temporary but high demand made on resource or library material, the breakdown of equipment are three examples specified by the respondents as being especially problematic in semestered schools.

(iii) The last of the negative aspects of semestered schools and identified through the data collection was, once again, time, but specifically the long time-frame between courses in the same or associated subject area. There could be a lack of continuity. Grade 9 French, for example, offered in the first semester may not be followed by Grade 10 French until three semesters later. The educational administrators expressed some concern that the students may have difficulty in retaining the knowledge or the specific skill (such as Music or Typing) without the continuous reinforcement activities.

The respondents noted that two master timetables must be completed per year; however, the second semester's timetable is very much dependent upon that of the first term. The administrators acknowledge that scheduling is time-consuming, but scheduling for a semestered school is even more so. Courses and programs must be sequenced, students' workloads require balancing, co-op e'ucational programs must be incorporated into the school year, and options available to the students must be balanced in order to ensure that the resources in the school are being used appropriately.

And the final comment made by several of the administrators was that it was difficult to maintain certain activities, such as the music program and mathematics contests, within a semestered school.

In all, the data collected did not provide any new reasons either for or against semestering. In some cases, however, the research elicited more specific reasons. What is apparent is that both the benefits and the problems associated with semestering are documented and appear to be understood similarly by educational officials administering and not yet administering semestered schools.

The research on semestering and scheduling has confirmed certain points. More and more Ontario secondary schools do seem to be becoming semestered, especially with the legimation of the OSIS document. Semestering does impose certain constraints on the planning of the master timetable. Moreover, the implementation of the decision to semester is replete with other school programmatic and structural concerns that also appear to affect the scheduling process. While semestering does offer the schools many benefits, its implementation is not without difficulties.

The research revealed, too, that the educational administrators are frequently the ones inextricably involved in the scheduling process. Adequate training for educational administrators in the scheduling process requires more than just accessibility and familiarity with the scheduling software. It also requires a knowledge of both input, the constraints on the system, and the output, the issues that may affect the successful implementation of the schedule itself. The research has attempted to identify these inputs and outputs, as well as the designers of the scheduling process.

3.0 The final question in this section (S3.0) was asked into order to have the respondents begin to articulate the process that they are and have gone through in the course of developing the school's schedule. While that information will form part of the data base for the intended but future development of the training program for educational administrators, it will not be addressed here.

Section III -- Management Information System

This third and final section was intended to elicit information on the actual and potential uses the educational administrators could perceive of a Management Information System. In order to guide the practitioner, two of the main purposes of the MIS were included in the questionnaire instructions: one, to document information and two, to sort or select information into various categories as required.

1. The first question (M1.0) was divided into two parts, in order to capture the names of data base software that is either being used by educational officials or names of such software that they have heard as being useful to their information needs.

Of the 76 total potential responses, 41 (or 54%) did not respond to the first question: If you already use Data Base programs, what are their names? The remaining 35 (46%) responded with one or more names of data base software, as recorded in Table 10 below.

Table 10
Data Base Programs Used

Software	Frequency Mentioned
Student Information System (SAS)	15
DBase II, III, or III+	8
Merlan	2
Appleworks	2
Symphony	2
CEMAS	1
Consultant	1
Data base on Burrough's mainframe	1
Data base on Columbia's mainframe	1
DSS System	1
Excel	1
File	1
Knowledge Manager	1
The Manager	1
Maplewood	1
Oracle	1
Reportpack	1
SIMS	1
Self-developed	1
The School System	1
Twin Lakes School System	1
Total	45

And 25 responded to the second part of that question asking the following: If you have heard of particular programs which may be suitable for these purposes, what are their names? A variety of software was mentioned, several different from those listed in Table 10. The second list is displayed in Table 11 below.

Table 11
Data Base Programs Mentioned

Software	Frequency Mentioned
DBase II, III, III+	7
Student Information System (SAS)	5
Trevlac	5
The Manager	3
Cogito	1
Lotus 1,2,3	1
Maplewood	1
Oracle	1
SSI	1
Total	25

The data from these two tables are consistent with the data included in Table 5, under column 3 (Filing and Retrieving), except the data base software identified here are less comprehensive. This discrepancy may suggest that the majority of educational administrators are not familar with data base software as a whole as a means of rapidly re-arranging and selecting information, as opposed to the wordprocessing function of the computer which quickly reproduces the data as entered.

2. The second question in this section (M2.0) asked officials to list useful categories which may be suitable to be part of their Management Information System. The response to this item was overwhelming: educational administrators appeared to be able to specify many uses that they could make of this approach. For clarification purposes, the suggestions have been collated into five categories: student data, teacher data, administrative purposes, scheduling, and subject data. Those headings are a logical outcome of the data; they were not imposed on the respondents in the original questionnaire.

a) Student data: The topics listed as relating to this fourth category are:

- -- student demographics, such as age, sex, grade, program
- -- student biographical and course data
- -- report card data and transcripts
- -- individual or aggregate lists of learning or medical problems, mother tongue, previous schools
- -- enrollments by course, subject, grade, program, school
- -- attendance, lates, withdrawals, re-entries
- -- individual or aggregate lists of passes and failures
- -- discipline reports and records
- -- credit accumulation, individual or aggregate
- -- student marks, individual or cumulative
- -- IPRC recommendations
- -- data on special programs, services, services
- -- summer school results
- -- class lists
- -- types of extra-curricular activities offered and lists of school teams
- -- student handbook/calendar
- -- lists of student names, addresses, and their guardians.

b) Teacher Data: The use of the Management Information System for the documentation and sorting of teacher data included the following topics:

- -- professional development activities
- -- qualifications and certification
- -- teacher profiles
- -- personnel information (demographics)
- -- teacher seniority
- -- personal leave/sick days
- -- extra-curricular activities
- -- history of teacher load
- -- supervision
- -- staff lists
- -- handbook for staff.

c) Administrative Information: Various administrative activities were listed as being suitable for the Management Information System. Those were documented as:

- -- inventories of audio-visual equipment, films, building assets, lockers and information on locker assignments, textbooks and textbooks issued to students, school supplies, and maintenance records
- -- transportation, such as bus routes, bus loads, bus lists, and bus pass lists
- -- library tasks, such as recording books both in and out of circulation, overdue book notices, and documentation of the card catalogue
- -- budgets for the school and each department, for documentation and control
- -- data relating to school boundaries, such as data on residents and non-residents
- -- career information
- -- graduation data, such as lists of those graduating, numbers attending ceremonies, those on honour rolls
- -- compilation of points for student awards and lists of those students achieving awards
- -- form letters of congratulation, discipline, and information to be mailed home and in response to routine queries
- -- documentation of health problems and accidents
- -- records of interviews
- -- homeform lists
- -- field trip lists and activities.

d) Scheduling: This third category relates to the allocation of resources within the school, to encompass the resources of time (class periods, rooms, students, and teachers). Those topics include:

- -- teacher utilization
- -- information on rooms in use and those free
- -- timetabling of students, teachers, and activities, both intra and extra-curricular
- -- period utilization
- -- free periods for students and teachers
- -- documentation of advanced and general course offerings per period
- -- scheduling of parents on parent night
- -- documenting and scheduling of weekly, monthly, and yearly school-related events.

e) Subject data: Specifically, the items collated under this heading are:

- -- physical education course packages
- -- business course packages
- -- technical course packages
- -- lists of Co-op Education students and their sponsors
- -- mark documentation
- -- statistical analyses, such as enrollments, medians, pass and failure rates
- -- exam/test/item analysis.

3. The third and final question (M3.0) in this last section of the questionnaire requested information as to the implications of using Data Base software. Specifically, the administrators were asked if they could anticipate any problems using this software.

Of the 76 potential respondents, 27 or 36% did not respond; 14 or 18% responded in the negative. From the remaining 35 respondents (46%), a variety of concerns were raised regarding implementation of Data Base software. Those concerns, along with their frequency of being mentioned, are brought out in the final table, Table 11, below.

Table 11
Potential Problems using Data Base Software

Comment	Frequency #	%
Confidentiality of data	9	26 %
Costs -- money, time, people	5	14
Must be easy to use and efficient (in time)	5	14
Loss of data	3	9
Skill required to design and modify data base	2	6
Training of secretary required to use software	2	6
No staff available to collate, input, update info	2	6
Problems of interface -- matching hard and software	2	6
Lack of background of educational administrators	2	6
Access problems	1	3
Difficulty in implementing change	1	3
Concerned, but no specific comment	1	3
Total	35	100 %

Note: Error in total percentage is due to rounding.

From the above table, the issues of confidentiality, loss of data, and costs in term of training, time, money, and staff appear to be the main areas identified as problematic with the use of data base software. The data clearly indicate that the educational officials have recognized that their own as well as staff training is required in order to use this software. Furthermore, this training encompasses all three dimensions of knowledge, skills, and attitudes.

Summary

This section of the research report documented the findings collated from the 76 responses to the mailed questionnaire. Three parts were included in this study and, consequently, in the questionnaire.

The first part of the questionnaire was designed to identify the range of breadth of computer hardware and software that secondary school principals and assistant principals were using in their work roles. A variety of systems were in operation, but the standalone Personal Computers (PCs) were clearly in the majority, with a range of functions,

and predominantly that of wordprocessing.

The second part attempted to uncover some of the issues inherent in one of the many planning tasks of the school's educational officers -- that of scheduling or the allocating of resources in a semestered school. Semestered schools are in the majority in Ontario in the late 1980's, especially since the release of the 1984 OSIS document. They are not a panacea to all educational problems, however. Educational administrators working in and not yet working in semestered schools offered insights into the merits and problems associated with those schools. While no new general information was brought out regarding the semestered schools, contstraints or contextual issues and procedural or implementation problems stemming from this issue were clearly and consistently articulated by both groups of respondents.

And the third and final section was an attempt to elicit reasons as to why the educational administrators should consider using data base software in their school's daily operations. Many excellent uses of this software for the Management Information System were identified by the users or potential users themselves. As awareness is the first step of long-term commitment to an issue and problem-solving, the documentation and sharing of this information on the widespread and most relevant use of computer technology is intended to help effect a great use of this software by the province's educational administrators.

The subsequent and final section of this research report concludes with a discussion of the implications of these findings. Recommendations for future activities of the researcher, trainers, and the school principals and assistant principals themselves are also forthcoming.

PART V
CONCLUSIONS & RECOMMENDATIONS

Overview

In the spring of 1986, the Queen's University Faculty of Education School of Graduate Studies and Research provided funding for a small scale research activity to be carried out in Ontario. The intent of the research was to establish or identify the level of awareness of the educational administrators (principals and vice-principals of Ontario secondary schools) regarding their use and knowledge of the capabilities of the computers for administrative or managerial purposes. Specifically, this pilot study was a small scale attempt at determining how educational administrators can use and potentially could use computer technology as planners.

The purpose of such research was to provide relevant and timely data as input into the development of professional development programs for these educational administrators. The preparatory programs are to provide practitioners with the knowledge, skills, abilities, and attitudes necessary to take advantage of the available computer technology and to meet the challenges of their positions within the information era.

One in every three secondary schools was selectively chosen within each of the 126 Ontario school boards in order to sample secondary schools which represent the differing situations in Ontario: the large and small school, the urban and rural school, the academic and comprehensive secondary school, and the separate and public school. Two hundred five letters personally addressed to the principals of those schools were mailed with an accompanying three-page questionnaire in May 1986.

Responses to that questionnaire were received over the next three months. In all, 76 questionnaires were returned, for an overall rate of return of 37%. The quality of the responses appear to compensate for the small quantity of returned questionnaires; for the most part, the responses were thorough, reflective, and provided what was considered to be very usable and relevant data.

The data were collated within each of the three distinct sections of the questionnaire and by each item. The first section of the questionnaire dealt with questions on the availability, types, and uses (actual and potential) of computers by the educational administrators themselves, as well as suggestions as to how computer-based training should be carried out. The second section was concerned with the scheduling process. Input into that process is an intention to have a semestered school, resulting into two 'master' timetables per year, but each mutually dependent upon the other. And semestering has implications for on the structure and implementation of programs and certain ensuing administrative issues. The research was intended to elicit information on the input, process, and output of the planning task of school scheduling. And the third section sought information on

their perceived and actual use of a management information system by Ontario's sample of educational administrators. As managers, they not only must have access to information in order to document and describe and reproduce it for various stakeholders in the educational system. In addition, educational officials must be able to select, expeditiously, appropriate information in order to answer questions, to legitimate their tasks, and to problem-solve.

Again, the ultimate aim of the data collected from this initial research activity was to identify where educational administrators currently are in terms of using computer technology in their jobs, and also how educational administrators themselves acknowledge that computer technology could be made useful for them. In essence, this study is a discrepancy assessment: having the user (de facto or potential user) determine; one, the current state-of-the-art and two, the future state. The resultant discrepancy or gap is to be overcome by designing relevant professional development programs for these educational administrators so that they can have access to, use, and adapt the existing computer technology to meet their needs.

The findings within each of the three sections of the research design are summarized below. The three sections are labelled as: one, background information on computer usage; two, scheduling; and three, management information system.

Background Information on Computer Usage.

The educational administrators, for the most part, do have access to a computer in their working roles. Indeed, a wide variety of computers were named by the educators but the Personal Computers and of that the IBM or its equivalent appear to be the most popular, followed by the VAX mainframe, and succeeded by the Commodore. All the computers mentioned were accompanied by a wide range of available software (computer programs) to carry out the different tasks of the administrator. Those tasks were identified in the following order of frequency: wordprocessing, filing/retrieving, student reports, planning, and budgeting.

Written tutorials are recorded as the preferred training mode; case studies are the least desirable means of training.

A range of ways in which the computer is perceived as being capable of helping the educators in their administrative roles was elicited. Saving time, report writing, and problem-solving are some of the general ways mentioned. Some specifics recorded are timetabling, budgeting, and maintaining inventories.

Scheduling.

The school's scheduling activities are developed most often in-house by an assortment of people: the principal, vice-principal, department heads, guidance counsellors, school librarian, computer coordinator, teachers, and the school secretaries. Outside sources of support include school board personel, Ministry personnel, and a small representation from private firms.

On the whole, the educational administrators (80%) appear satisfied with the existing method of designing the master timetable. Several concerns were mentioned, such as software should be used for timetable development and timetable problem-solving in addition to the storage and display of information. Also more training and a faster turn-around time are considered desirable for the Ministry's ECNO system.

Of the 76 schools in the sample, 63% were either all or partially semestered at the time the questionnaire was completed (May/June 1986). This finding is consistent with Pierce's (1985) observation.

A wide range of merits and problems of semestering are offered by the educational administrators of both semestered and non-semestered schools. The two groups appear to have consistent perceptions on the topic; their reasons reinforced, for the most part, the existing literature on the subject. The comments provided more specific insight into the attibutes and the concerns of semestering, but did not elicit any new issues on the topic. And, as often found in problem-solving, what someone identifies as a constraint or a problem, another mentions the same point as being an asset. Attitude, then, can be seen even here as playing a role in the educational administrators' positive or negative perspective towards semestering.

Management Information System.

A Management Information System is a system which not only allows for the documentation and reproduction of information, but also selects and displays only that specific information as required -- information which is chosen from a more comprehensive data base. Data base software, even by the nomenclature, are designed for such purposes.

Less than half (46%) of the respondents appear to be familiar with data base software. However, a variety of data base software was mentioned. And those that responded indicated that the software could be used for a range of applications. These uses have been grouped under the five headings of student-related (including such things as personal or demographic data and school-generated data such as marks and grades), teacher-specific actions (such as qualifications, sick days, curricular and extra-curricular activities), administrative applications (such as public relations, budgeting, and inventory documentation and control), scheduling (or, more inclusive, resource allocation, and subject-related information (such as exam data, item analysis).

Several potential problems using data base software are brought out, with the most pressing being that of confidentiality of data. Resource constraints, such as lack of time, money, training, expertise, and access, are also mentioned.

Conclusions

Between the review of the literature and the results of the research instrument, many reasons have been identified to rationalize the use of computer technology particularly as applied to a secondary school's educational administrators' role as a planner. Pages 10 to 11 in Part II, the literature review, and the responses to questions C4.0, pages 28 and 29, and the responses to question M2.0, pages 38 to 40, provide cumulatively a much wider knowledge base to the educational officials as to the diverse assortment of tasks that are well suited to existing computer technology.

As well, however, problems regarding the use of computer technology by these educational administrators which may contribute to a lack of usage and a lack of creative uses have also been identified through the same data bases. Such concerns are a lack of confidentiality, a lack of resources (time, money, people with the necessary expertise in order to provide the training, equipment, authority, information), a lack of support within the educational system, a fear of losing data such as student records, lack of compatability of equipment within the provincial educational system and even within a school, and a lack of accessibility.

Recommendations

Accordingly, in order to ensure that educational administrators are and will use computer technology in both the routine and more creative or entrepreneurial activities of a school, a series of recommendations are forthcoming. These recommendations follow the overall format of that proposed by Fullan (1982) in his advocacy of planned, not temporary or whimsical, educational change. The recommendations, then, are listed under the same three headings which he proposed: one, the adoption or initiation of change; two, the implementation of change; and three, the continuation of change.

Phase I -- Adoption of Change.
It is recommended that:

1. Policy either in the form of legislation or objectives be developed, articulated, and communicated on a school board basis regarding the desirability of the use of computer technology within the educational institutions.

2. This policy be augmented by concrete support directed to the intended users, the educational administrators, in the form of resource commitment and allocation. Such resources are to include, for example, time off for training (both the trainers/board consultants and the users the educational administrators themselves), as well as money for training, coaching, and equipment purchases (both computer hardware and software programs).

3. Active involvement of educational administrators in the initial planning stages to identify not only their training needs but also the resources necessary for meeting those needs and overcoming the raised

concerns.

4. Initial introductory preparatory sessions regarding some general training on and uses of the computer, such as wordprocessing, spread sheet, and data management programs, plus opportunities to discuss the merits and implications of such change with peers, super and subordinates, and experts.

5. The establishment of a realistic time frame for the initial implementation of computer technology in the administrative tasks. Some lead time is essential in order to allow those affected to reflect upon and adjust to the proposed change, and consider the implications on other areas within the school's domain.

6. Some initial resource planning, to consider new acquisitions, re-assignments, or re-allocation of equipment, facilities, and staff and also to consider staff functional and concomitant building changes (such as more electrical outlets, different types of lighting requirements).

7. Specific training for support staff and for those who will perform many of the daily and routine tasks of data entry, data output, data back-up, and data verification.

8. Overall policy be established regarding the management and control of the computer system, such as policies regarding access and availability to ensure confidentiality of data.

Phase II -- Implementation of Change.

Subsequent to the recommendations advocated within phase I, it is further recommended that:

1. The school board continue to:
a) clarify and communicate the reasons for the change,
b) set realistic goals and feasible timelimes for the incremental implementation of computer technology by the educational administrators,
c) demonstrate its commitment by providing resource support.

2. The educational administrators within a board or area level form a support group to facilitate their computer training, as well as to encourage the identification, sharing, and discussion of issues associated with the daily and routine uses of the computer, software applications, and problem-solving on the computer.

3. As many of the educational administrators' tasks as possible be automated, adhering to Pogrow's (1983) principles for automation which is based upon, essentially, a criterion of efficiency.

4. Training of educational administrators be carried out mainly for the general, routine, and practical applications of the common computer programs (wordprocessing, spread sheet, data management) and on some creative uses and applications of this software as well.

5. This training should include such things as how to schedule or carry out large scale planning (for example, using the Critical Path Method or Program Evaluation and Review Technique), and how to model and implement computer simulations. This latter skill encourages innovative problem-solving by seeking alternative solutions, given changes in context or constraints.

6. Training be carried out by an individual who is known and respected within a school, board, or proximate educational community. Preferably that individual be on-site and readily accessible to those school officials on an on-going basis.

7. Hands-on training sessions be accompanied by documentation in the form of written tutorials. These tutorials should be developed by personnel with educational expertise, rather than strictly computer expertise.

8. The computer be used on a daily basis, and in a visible location, with easy access by its users. The educational administrator is the instructional leader within a school; accordingly, s/he should demonstrate to other staff, visitors, and students that the computer can be used and is being used daily in its school administration activities.

9. The ECNO software program for developing (and not just reproducing) a school's timetable (Student Scheduling System -- SSS) continue to be used by those schools whose boards are connected to the Ministry.

10. The Ministry provide appropriate training to the personnel within the school who develop and maintain the master timetable. That training content should be determined as a result of close consultation with the users -- the principals and the vice-principals.

11. The Ministry and the school board investigate ways to reduce the turn-around time and hence increase the accessibility of the data within the programs sponsored by ECNO to those school officials who require them.

12. Schools continue to be semestered, but that the problems associated with these schools be discussed and alternative solutions be both proposed and implemented at the beginning of each school semester.

Phase III -- Continuation of Change.

A final set of recommendations are made for the third part of the change process, in order to ensure that the change is persistant and fully implemented. It is recommended that:

1. The users attend workshops on both the administrative and instructional uses of the computers. While continuing on with their own professional development, the officials actively use and apply these new skills and yet continue in their visible role as the school's instructional leader by setting an example for the teachers.

2. The users continue their training on the computer, but now focus more on the creative, rather than merely the routine, aspects of the software. Their objective should be adapting and integrating software for their increased flexibility and utilization. For example, rather than using a "canned" program to analyze class marks, the individual may wish to develop a school, department, or division's own spread sheet program to simulate, more accurately that specific means of grading.

3. The educational administrators subscribe to and read at least one of the popular computer journals in order to remain current on the topic.

4. The users maintain their computer network and/or support group in order to share ideas and advice, and articulate, debate, and solve educational, administrative, and/or computer application problems.

5. The leaders take time to visit other schools in order to become even more aware of innovative uses and applications of computer software that their peers have found or designed.

6. The educational administrators work towards an objective of system-wide compatability of computer technology in their long-term planning in order to facilitate sharing among and within schools and for market manoeuverability.

7. The leaders make specific demands of computer sales personnel with respect to software and hardware needs, as well as to Ministry officials. The point is to keep others updated of the school administrators' evolving needs as their knowledge base expands, and to provide opportunities for the higher educational officials to demonstrate continuing support for this change.

8. The budget for computer-related equipment and supplies be incorporated into the school's regular budget, and no longer treated as an extra or as a special funding item.

9. The educational administrators as instructional leaders encourage others within the school or educational community to develop professionally in the area of computers. They might consider offering appropriate inducements to motivate other educators to use, apply, experiment, and revise the existing or new computer programs. Other linked organizations within the larger educational community such as the Ministry of Education, the Ontario Educational Research Council (OERC), the teachers' federations, and the faculties of education could demonstrate a similar support by offering research grants, scholarships, or other awards of merit or recognition for work in this area.

10. The educational administrators continue to assess their long-term computer technology plans, and all the while identifying, scheduling, monitoring, and attempting to meet their articulated short-term goals.

11. Longitudinal research be carried out to determine the quality and quantity of the utilization of computer technology by educational administrators. Are they, for example, less stressed and have more time for different tasks than before their reliance on computers? Are they using the computer software as tools or as trainers of the mind? What

additional competencies to the school leaders have or would like to have? How should the preparatory programs such as the Principals' Courses and the Master's of Education program be revised?

12. Longitudinal research continue to be carried out to determine the effects of semestering. Is the teaching/learning situation more effective? Have the educators found ways in which to overcome successfully the problems inherent in semestered schools? Are there, perhaps, certain subjects, programs, or certain levels that should remain non-semestered? Have the receiving organizations (work or post-secondary institutions) recognized any differences in students who have been the product of semestered schools? What do the students and the graduates consider to be the benefits and problems associated with the semestered schools? For example, do students continue to feel a greater sense of belonging in schools which are not semestered? If so, what alternatives can be tried to ameliorate this situation? (The review of the literature regarding semestered schools in Part II of this report has noted some areas worthy of further research.)

This study has made a small but initial attempt at identifying and addressing the needs of secondary schools' educational administrators, in order to assist them in using and applying computer technology to their jobs. Not only was the current state-of-the-art researched, but also both the impediments to change and the advantages of a reliance on computer technology were elucidated by the respondents. The findings have been structured into the framework proposed by Fullan (1982) in order to highlight and ensure comprehensive and long-term educational change. Perhaps if these recommendations were implemented, then the educators within the Ontario educational system as a whole will become proactivists as the information era progresses into the 1990's.

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APPENDIX I

LETTER TO PRINCIPALS

FACULTY OF EDUCATION
DUNCAN McARTHUR HALL

Queen's University
Kingston, Canada
K7L 3N6

May 8, 1986

Dear Principal _____

Computer Technology is here to stay, we've been told! And we've also been informed that it is up to us to learn how to use the technology so that we become "better educational managers", in order, ultimately, to make our schools more effective. Even as a professor of educational administration who has some computer expertise, though, I know that it's easy to say such things as "familiarise yourself with appropriate computer software", but hard to do.

What I'd like to do is to help educational administrators (principals and vice-principals) zero in on the more appropriate educational administrative software and the ways of using that software. I would like to assist fellow administrators, in the long term, by developing some learning materials to make this transition. Moreover, I will require <u>your</u> input in doing so.

The project that I have undertaken is to investigate
a) what equipment (hardware and software) you have;
b) if and how the computer is being used in the various roles associated with "the principal's office"; and
c) whether certain tasks in particular are being carried out, or would be considered being dealt with by means of computer software.

As a start, I have focussed on the scheduling problems that secondary school principals face and, secondly, the cataloguing (filing and retrieving) of information that administrators require. (Note that the computer jargon used with respect to this last topic is often referred to as "Data Base" programs.) The questionnaire that is attached deals with all these issues.

As you'll note from that questionnaire, no name is necessary on the returns, in order to ensure anonymity. I have asked, however, that you record any outstanding and easy to use "administrative" software that you have come across. And if you feel that you would like to share your computer (software) expertise with me, please indicate that on the questionnaire itself.

/2

I will be collecting and tabulating this data over the course of the 1986-87 school year from my sample of secondary schools in Ontario. I intend to evaluate and then document all of the more exemplary software programs that are considered relevant to you. All these (collective) results will be written up. And, as a token of my appreciation for your assistance, you will get a copy of this report, although probably not until April 1987.

In anticipation, I thank you for your interest and participation in my study. I would appreciate it if you would pass on the second copy of the questionnaire to the vice-principal for her/his completion. Please return the completed questionnaire to me no later than 10 June, at the following address:

Dr. Ruth Rees
Room A 215
Faculty of Education
Queen's University
Kingston, Ontario
K7L 3N6

Yours truly,

Ruth Rees, Ph.D.

Encs.

APPENDIX II

QUESTIONNAIRE

When completed, return by
10 June 1986 to:

Dr. Ruth Rees
Faculty of Education
Queen's University
Kingston, K7L 3N6

COMPUTER USE

C 1.0 **Do you have access to a computer for your administrative tasks?** Yes ☐ No ☐

Name of the Software	Type of Computer on which it is used	Special Equipment /Interfaces required	Purpose(s) for which the software is used					
			Planning	Budgeting	Filing & Retrieving Information	Student Reports	Word-Processing	Other (Please specify)
1.			☐	☐	☐	☐	☐	
2.			☐	☐	☐	☐	☐	
3.			☐	☐	☐	☐	☐	
4.			☐	☐	☐	☐	☐	
5.			☐	☐	☐	☐	☐	
6.			☐	☐	☐	☐	☐	

(Please indicate any outstanding, "easy-to-use" software by an "*")

C 2.0 **If appropriate software were available, would you use the computer in your administrative duties?** Yes ☐ No ☐

C 3.0 **If suitable learning materials were available, would you be more inclined to use a computer?**

Yes ☐ If not, why not? .....

.....

C 3.1 **If you would like learning materials for specific pieces of software, what form(s) would you like these to take? (please number in order of preference)**

- ☐ written tutorial
- ☐ reference materials (applied to context of eductational administration)
- ☐ case studies on the implementation of particular software in schools
- ☐ common questions/problems and their answers or solutions
- ☐ none of the above unless accompanied by in-service training

C 4.0 **How would you like the computer help YOU in your administrative role?**.....

.....

.....

- - Use other side as needed

SCHEDULING

S 1.0 Who assists in the development of the school's Master Timetable ?

Educational Data Processing Branch (MoE) ☐ Board ☐
Staff/students ☐ Private Firm .....
Other .....

S 1.1 Is this method satisfactory? Yes ☐ No ☐

Please explain .....
.....
.....

S 2.0 What category below describes the arrangement of courses within your school?

Full year ☐
Trimestered ☐
Semestered ☐
Mixed (please explain) .....
.....
.....

S 2.1 What do you consider to be the pro's and con's of semestering?

Pro's	Con's
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

S 3.0 What steps do you and/or your timetabling committee go through in developing the schedules. (I will be evaluating "scheduling" software for schools. I require the information from you in order to determine whether a particular piece of software is suitable.)

.....
.....
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.....

MANAGEMENT INFORMATION SYSTEM

A Management Information System has two main purposes. It encourages: one, the documentation of information, and two, the re-arrangement of information into different categories as they are required. Both purposes can be useful to the manager; hence the name Management Information System.

For example, you may want to know the availability of Room X for Period Y on Day Z. Or, you might want to know which staff have attended a session on curriculum design in the last five years.

Information of these kinds can be documented and retrieved using Data Base programs on the computer.

M 1.0 If you already use Data Base programs, what are their names? .....

.....

or

If you have heard of particular programs which may be suitable for these purposes, what are their names? .....

.....

M 2.0 What categories of information do you foresee as being useful for these purposes? A few categories have been introduced as examples.

Room Utilization	*Family Background of Students*
Teacher Characteristics	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

M 3.0 Can you anticipate any problems using Data Base software?

.....

.....

.....

Thank you

You may have come across some interesting software. If you would like to share your information with me, please use the space provided below.

NAME : .....
PHONE # : .....
ADDRESS : .....
.....
.....

APPENDIX III

RESPONSES TO QUESTION C4.0

Item C4.0 asked the question: How would you like the computer to help YOU in your administrative role?

Because the responses were unique and well-articulated, they are presented verbatim below. As well, these responses are summarized in Part IV, The Findings. The order of the responses has no implications; it merely reflects the order in which the responses were collated.

"Have one [computer] at home, but not compatible with any computer at school. Use it for certain word processing tasks. Compatability would allow work to be done when needed and on school time."

"Eliminate some of the repetitive tasks."

"Quick retrieval of information."

"We have an on-line facility to the Baord mainframe that provides several administrative functions for us. However, some personal planning/calendar/appointment programs useful, eg., Sidekick. Also [programs for] exam and parent night scheduling useful."

"I am quite happy without it, but would find an inventory of teachers and their qualifications useful. I have this info in hard copy form."

"Variety of ways -- essential today!"

"To keep a file of student discipline -- every time I see a student I would like to make a note of it in a computer that can be easily retrieved and summarized."

"Immediate retrieval of information."

"Immediate correction of numbers, lists, etc."

"Reduce administrivia."

"To handle clerical tasks quickly."

"Reduce paper, store data in meaningful ways, easy access and retrieval in useful ways."

"Information retrieval (attendance, marks)."

"Planning (exam and Master Timetable)."

"Budget -- Principal's report."

"To assist in improving accuracy of data and reducing paper and reports by having entries applied to all files."

"IBM attendance system."

"To lessen the tedious task of data retrieval "

"I would like help in the timetabling (creation of the schedule)."

"Yes, inquiry into B of Ed data base."

"Budget controlling and the September Ministry report."

"Scheduling of the Vice-principal, student timetable changes, list changes."

"I would like to download and upload from our Vax at the Board office."

"Filing of information to enhance our ability to complete surveys such as the September report, Month end attendance report, staff information requests, etc."

"Recording of daily attendance, mark information, etc."

"Word processing systems for secretarial tasks."

"Organizing information and data so that decisions can be fully informed."

"I'd like to process information for which I am asked, to provide fast access to particular student records, to allow for good timetabling."

"All student data on central office file -- one entry, not multiple entries."

"All inventory, e.g., library, textbooks, chemicals on file."

"I need fast access to finromation. Currently I am trying to load in data to a data base. My C128 is too small."

"To simplify the various administrative procedures which are repetitious by nature."

"Satisfied with everything we now have, but time is needed to understand and utilize it completely [refering to SAS]."

"SAS is most useful."

"Recall of student records."

"All other aspects presently covered by board operated computer."

"Remove the time-consuming repetitive tasks."

"Provide quick access to a variety of files, e.g., student records."

"Planning -- reduce time to produce relevant reports."

"Reliable data base."

"Analysis of timetable conflicts, 'if-then' scenarios."

"I feel that I am obtaining very significant assistance at the present time with the computer hard/software available to me [referring to SAS, C64]."

"Standalone computer with the following software: Budgeting, data base, word processing, i.e., Lotus 1,2,3 type."

"Predictions and tighter control of all aspects of the operation."

"Sometimes it would be handy to access a student's file to obtain information needed for an interview. I get many other reports that keep me up to date."

"Provide information in any sort/select."